ISDA 2010 Agriculture and Food
Montpellier – France
28 June – 1er July 2010
Innovation and Sustainable Development
in Agriculture and Food
www.isda2010.net

TRADITIONAL KNOWLEDGE, INNOVATION SYSTEMS AND DEMOCRACY FOR SUSTAINABLE AGRICULTURE: A CASE STUDY ON *ADI* TRIBES OF EASTERN HIMALAYAS OF NORTH-EAST INDIA

Saravanan RAJ

Associate Professor (Communication) &
In-Charge, School of Social Sciences
College of Post Graduate Studies
CENTRAL AGRICULTURAL UNIVERSITY
Umiam, Barapani – 793 103
Meghalaya (State), INDIA
saravananraj@hotmail.com

Abstract — Global attention on natural resources management and environmental protection issues are getting an utmost priority during last few years. Worldwide scientists, policy makers, environmentalists and opinion leaders are trying to address the issues in all the possible ways. However, ever increasing population and demand for the increased food production depletes the natural resources at faster rate. Further, modernisation and urbanisation process leads to adverse environmental problems. In contrast to the present global scenario, in remote corners of the few countries, aboriginal communities are silently conserve the natural resources and maintain the biodiversity and achieving sustainable agriculture by their traditional ecological knowledge, collective decision making process and local democratic institutions. In this context, this article deals with *Adi* tribal community of Siang valley in Eastern Himalayas of North-East India. Case study draws clear inference on tribal communities' traditional knowledge, innovations and their democracy in regulating sustainable agriculture, natural resources management and biodiversity conservation. Tribal farmers cropping systems are based on rich indigenous ecological knowledge gained over the generations. The field preparation, choosing of crop varieties and season of sowing, intercultural operations, organic soil nutrient management, soil and water conservation techniques, ecological pest and diseases control measures, harvest and storage methods showcase their rich traditional knowledge on sustainable agriculture and natural resources management techniques. This case study very specifically lays emphasis on *Adi* tribe's traditional ecological cultivation and management techniques on major cultivated crops such as; rice and maize, citrus group of fruits, pine apple, *etc*. Crucial decision on farming, water management and fallow period are regulated by strong democratic system called "*Kebang*", Adi tribe's traditional village council. The *Adi* tribes mixed crop orchards and traditional homestead agro-forestry demonstrates well developed indigenous systems and emphasises productivity and sustainability. Further, it demonstrates optimum utilisation of available land and other natural resources. A multitude of crops presenting a multi-tier canopy configuration makes balanced utilisation of environmental resources. Apart from traditional ecological knowledge and local democratic institutions, people's belief, taboos and customs facilitates the sustainable farming and protects the environment. Further, continuing traditional food habits of *Adi* tribe necessities conservation of large number of wild vegetables. This article also addresses the emerging conflicts in the *Adi* tribal community due to government policy, developmental departments' intervention, modernisation, changing attitude of younger generation, electronic mass media influence and high input unsustainable advanced farm technologies. Even with emerging conflicts, during this fast changing globalisation and commercialisation era, farmers of Adi tribe celebrate sustainable agriculture as their way of life.

Key words : Knowledge, innovation, democracy, conservation, agriculture.

INTRODUCTION

The history of human civilization is the history of development. Man has made tremendous progress in almost all walks of life since Stone Age. Over the centuries, innovation coupled with man's search for excellence and creativity has made such development is possible. Even today, there are few communities around the Globe practice their indegenous knowledge, local innovations and creativity for their day to day life. Based on their rich ecological knowledge they manage natural resourses and conserve the bio-diversity. This article highlights the *Adi* tribe's traditional village council, the *Kebang*, and its role in regulating agriculture and natural resourse management and bio-diversity conservation, traditional farming and cropping pattern, traditional knowledge in pest and disesaes control, home stead agro-forestry system, traditional food habits, recent conflicts and way forward.

The ***Adi***, is one of the major tribe living in the eastern Himalayan hills and they are found in the sub-tropical regions within the districts of East Siang, Upper Siang, West Siang and Dibang Valley Districts of the Arunachal Pradesh State of North-East India. The literal meaning of *Adi* is "hill" or "mountain top". They have well organised traditional village council called *Kebang*.

Figure. Map showing the locale of the study area

Description of Study Area: The selected villages (Yagrung and near by villages) are located in the Pasighat circle of the East Siang district of Arunachal Pradesh State of North-

East India. The average annual rainfall is 4400 mm. Generally, rocky sandy loam soil with the pH ranges from 5.0 to 6.5 and sub-tropical climate condition favours cultivation of a wide range of crops. The major cultivated crops are rice, mustard, maize, mandarin orange, pineapple and vegetables in the foot hill and mid hill areas. The prevalence of shifting cultivation system ("Slash and burning" or "Jhum" agriculture system) involves slashing and burning of the vegetation on hill slopes and using the land for cultivation for one or two years. Then farmers move to new area for doing the same practice. After seven to eight years (In recent years, the Jhum cycle interval is reduced to three to four years) of interval, the farmers return to the same area for doing shifting cultivation (Saravanan, 2009).

Their staple food is rice. Maize and millets also supplement the food. Hunting, fishing and utilization of Non-Timber Forest Products (NTFPs) are part of their culture. Barter system was prevalent till few decades ago. People are gradually adopting the modern ways. The *Adi* tribe is patriarchal and also patrilineal whereby descent is traced through the males. The *Adi*, tribal community who worship the Sun and the Moon God, namely Donyi-polo and Abo-Tani, the original ancestor for the Adi tribe. Their religious rituals largely coincide with the phases of agricultural cycles. They worship nature and make animal sacrifices and traditionally practice Jhumming or shifting cultivation. The *Adi* tribe extensively practice irrigated rice cultivation and have a considerable agricultural economy. The *Adi* tribe is unique in having traditional rights of land, water and forests within their jurisdiction. The *Adi* tribe as a community exercises control over the natural resources within their surroundings. There are no written land records of ownerships among the *Adi* tribe. However, traditional boundary demarcation of land lines between the villages, tribes and clans are maintained through natural features of streams, hills and other land marks which is honoured by everyone. Any dispute arising between the clans, villages and tribes, the same is settled amicably by the village elders through the system of *Kebang*, an village tribal council among *Adi* community members (Misra and Dutta, 2003).

***Kebang- Adi* Tribal Village Council:** The well organised village council called *Kebang*, which administers the village affairs, manages and conducts day-to-day problems of the village. Regulates, formulates laws and issue ordinances for the well-being of the society. The *Kebang* was formed naturally. The village elders become naturally become village *Kebang* members. The *Kebang* is a Democratic institution and *Adi* tribals are traditionally republican democratic and socialists in aspiration. The *Kebang* does not rule out capitalistic economy, however, at the same time, they attach importance to the sociologistic ideology. Equality in distribution of wealth and oppourtunities are on their cards (Danggen, 2003).

Role of Kbang in Agriculture & Natural Resourse Management :

1. Agriculture :

In agriculture, *Kebang* performs following activities;

a. **Allotment of new land area for agriculture:** New farm lands are alloted to the interested farmers by the *Kebang* for the cultivation.

b. **Farm fencing:** Before the start of the cropping season, bamboo based community fencing was carried out by the *Adi* community members as per the direction of the *Kebang*.

c. **Cropping pattern & crops:** Type of crops and cropping pattern also regulated by the *Kebang* based on the resourses avialbility (availability of irrigation water/ quantum of the rainfall in the particular cropping season).

d. **Water distribution and water management:** The *Kebang* regulates the water distribution system from the rivers and riverlets. Facilitates the construction of the small checkdams and irrigation channels by community work.

e. **Pest & diseases control campaign:** To control some of the plant pest and diseases community campaigns are arranged by the *Kebang*.

f. **Support for farm extension services:** The *Kebang* extends needed support for the public, private and NGO's extension programmes by asking appropriate community members to participate in the programmes.

g. **Fallow period:** To maintain soil heath and nutrient status and also to provide grassing land for the house hold draught animals, *Kebang* passes orders to maintain fallow land during the particular season in each year.

2. Natural Resourse Management & Bio-Diversity Conservation:

The *Adi* tribe is unique in having traditional rights over land, water and forests within their jurisdiction. The *Adi* tribal community exercises control over the natural resources within their surroundings. There are no written land records of ownerships in the state. However, traditional boundary demarcation of land lines between the villages and clans are maintained through natural features of streams, hills and other land marks which is honoured by everyone. Should there be any dispute arising between the clans, villages and tribes, the

same is settled amicably by the village elders through the system of *Kebang*. Hunting, fishing and utilization of NTFP's are part of their culture (Misra and Dutta, 2003).

a. **Control over forest resourses:** The *Kebang* exercises control over the Forest resoures. Forest timber and Non Timber Forest Products (NTFP) utlization behavoiur is regulated by the *Kebang*.

b. **Community fishing:** To conserve fish bio-diversity and also to allow breeding period, the *Kebang* bans fishing by the individuals and promotes community fishing during particualr period.

c. **Community hunting:** To discourage indiscriminate hunting, the *Kebang* allows only limited community hunting during certain specified periods and during community rituals and also in the demarcated forest area.

d. **Conservation of flora and aforestation programmes:** The *Kebang* takes special interest in conserving natural flora and undertakes special conservation and afforestation programmes for the maintenance of natural vegetation.

The violation of *Kebang* direction in conserving natural resourses and bio-diversity by the individuals are punished by imposing fines.

Traditional Farm Practices : The *Adi* tribe follow natural farming and by default the *Adi* tribal farmers are practicing organic cultivation. The *Adi* farmers practice the crop rotation based on land availability. In the upper and mid-hill areas, direct sown Rice/ Maize-Ginger-Mustard are generally followed. In foot hill areas, irrigated rice is cultivated as a monocrop and some time pulses are also raised as an intercrop.

Cropping Pattern: The *Adi* tribal farmers practice "Slash and burning" or "Jhum" agriculture system in hilly ares, they maintain bamboo plantations and mandarin orchards, pine apple gardens. In plain areas (foot hill areas), they cultivate irrigated Rice crop as a mono-cropping system, where assured irrigation is available through rivers and river lets. In Juhm land, they follow mixed cropping system as an rainfed cultivation. The *Adi* tribe's staple food is rice. Maize and millets also supplement the food requirements.

Ecological Pest and Diseases Control Methods: The *Adi* tribal farmers folow the ecological pest & diseases control measures over the generations. For example, *Citrus grandis* (Pummelo) leaves used as insecticidal and repellent for the control of the rice pest *Leptocorisa oratorius* (Fab.). House hold ash is used as a repellent to control pests and diseases of the cultivated crops. Fruit trees (*Bridelia retusa*) and animal bone tied with horticultural plants are used as attractants for attracting pest predators. Some of the pests

are controlled mechanically. For example, Citrus trunk borer (*Anoplophora versteegi*) is mechanically controlled by inserting sharp bamboo sticks in the affected Citrus trunk. Apart from this, number of traditional traps were used for control of rats in the rice fields. After harvest of rice crop, grains were stored in well protected Indigenous Granary, which inhibits any pest and diseases of stored grains.

Bari- A Traditional Homestead Agro-forestry System: Bari, a traditional homestead agro-forestry system practiced over the generations by the *Adi* tribal community of Siang valley in Eastern Himalayas of North-East India, demonstrates sustainability, productivity, food security, environmental protection, biodiversity conservation and natural resources management. This case study was prepared by conducting survey among 500 *Adi* tribal families and lays emphasis on *Adi* tribe's traditional agro-forestry management techniques and its economics. The *Adi* tribes' traditional and ecological homestead agro-forestry demonstrates well developed indigenous ecological knowledge systems and emphasises productivity and sustainability. Further, it demonstrates optimum utilisation of available land and other natural resources. A multitude of crops presenting a multi-tier canopy configuration makes balanced utilisation of environmental resources. Among 500 *Adi* tribal families, 258 families' homestead agro-forestry was selected for economic analysis. Cent per cent of the homestead agro-forestry growing tribal families were cultivating vegetables as one of the important components of homestead agro-forestry. Forty-four per cent (44%) of farmers were using agro-forestry produces for their self consumption and remaining proportion of farmers were using for self consumption, marketing, medicinal and decoration purposes. Fifty-six per cent (56.34%) of farmers regularly marketing the homestead agro-forestry produces, which gave on an average Rs.13,725 (USD 276.52) as additional income per year per family. This income was generated from an average land area of 200 square meters without any external input and using only family labour. This income mostly generated and maintained by the women members of the family. Analysis of its components, nature of crops, cropping pattern, veterinary and animal husbandry components and its benefits reveals interesting facts about the *Adi* tribal community's traditional homestead agro-forestry system. Integrated farming system, nutrient recycling and bio-mass waste management principles are applied by the tribal farmers. Further, homestead agro-forestry units used as a "local experimental farms", "indigenous pharmacy" and also as "bio-diversity conservation units".

Traditional Food Habits: Many indigenous varieties of cereals (mainly paddy and millet crops) pulses, oil seeds, vegetables and spices are being conserved under the shifting cultivation system. There are 74 indigenous varieties of these crops, which are locally grown,

conserved and used to fulfill the diversified needs of *Adi* community members. In creating diversification under the rainfed farming situations, women wisdom are more useful than men folk and have domesticated many local plants varieties under the shifting cultivation for the food security. Few of the local varieties of vegetables and spices are now getting more credit in the local market and economically viable for the women empowerment. The tribal women are custodians and treasures of plants' knowledge and are able to identify the edible and non-edible wild plants and they prepare many ethnic foods rich in nutrients, and are compatible to the location, ecology, economy, ethnicity, culture and more than this, humane in nature. To diversify the crops for narrowing the risk in uneven land, the gender and locally available resources play significant role and environmental sustainability of highly extinctive plants is assured by domesticating it in the shifting land and home-stead agro-forestry. Type of soil, fertility status, moisture level, topography and distance to approach the crop fields, are leading factors considered by tribal people to grow and diversify the indigenous crop varieties (Singh, 2009). Another documentation by Srivastava and *Adi* community (2009) revealed that 108 species are used for food and medicinal purpose by the *Adi* community members in their day-to-day life. Sarangi *et. al.,* (2007) reported that pseudocereals, small millets, indegenous pulses, oil seeds and many forest plants form an important component of food source for the tribal population. These species have been used as life sustaining food as well as medicines from time immemorial. Some of the indegenous life supporting plants of *Adi* tribe are; Bamboo (*Bambusa indica* Arundinacea (Retz.) Poaceae), Indigenous leafy vegetables (*Brassica juncea* (linn.), *Spilanthes acmella*, *Zanthoxylum rhetsa* DC., *Rhynchotehum ellipticum* Wall ex Dietr DC., *Mussaenda glabra* Vahl. *etc*.), Indigenous grain plants (*Phaseolus* spp., *Sorghum* spp., *Prema bengalensis*, *Zea* spp., *Sesamum* spp., *Eleusine coracana*, *Amaranthus spinosus*, *Pennisetum typhoides*, *Vigna* spp., *Coix lacryma* jobi L. and *Fagopyrum esculentum etc.*,), Indigenous edible fruit plants (*Baccaurea sapida.* Roxb. Murll (Euphorbiaceae), *citrus deumana* Linn, *Adina cordifolia* Roxb., *Musa velutina, Garcinia lanceaefolia etc.,),* Indigenous vegetables (*Abelmoschus* spp., *Slanum melongena* Linn*., Amorphophallus campanulatus Blume, Canvolvuus spp. Colocasia esculenta* L. e*tc.,)* Indigenous spices and condiments *(Elettaria* Spp., Wild Chilli-*Capsicum* spp., *Cucurma amanda, Cassia tora* L., *Cucurma longa*, etc.,). Another study by Sureja *et. al.* (2007), the *Adi* tribe use annual and perennial vegetables plants like *Diplazium esculentum*, *Solanum torvum*, *S. spirale*, *S. indicum*, *Spilanthes oleracea*, *Amaranthus spinosus*, *A. tricolor*, *Brassica juncea* var. rugosa, *Chenopodium album*, *Eryngium foetidum*, *Fagopyrum esculentum*, *Xanthoxylum rhetsa*, *X. nitidum*, *Gynura crepidioides*, *Pouzolzia benettiana*, *Mormordica cochinchinensis*, *Bauhinia variegata*, *Manihot esculenta*, *Ipomoea batatas*, *Clerodendrum colebrookianum*, *Murraya koenigii*, *Houttuynia cordata*, *Urtica parviflora*, *etc*.

as vegetable, either alone or in combination (to improve the taste/ aroma or neutralize the bitterness/ astringency). Some of these vegetables are used to cure diseases like high blood pressure, diabetes, urinary and stomach disorders, bronchitis, diarrhoea, *etc*. The chemical and nutritional composition studies showed that some indegenous species such as *Basella rubra*, *Diplazium esculentum*, *Pouzolzia bennettiana* and *Glochidion multiloculare* are richer in minerals and energy compared with common vegetables such as spinach, amaranth and cabbage (Bhardwaj *et. al.*, 2009).

Recent Conflicts in *Adi* Community

***Kebang* and Gram Panchayat:** After the introduction of the Gram (Village) Panchayat by the Panchayat Raj system (*Panchayati Raj*, a decentralized form of Government, where each village is responsible for its own affairs, as the foundation of India's political system. Panchayati Raj is a system of governance in which gram panchayats are the basic units of administration. Gram (Village) Panchayat is a council of elected members taking decisions on issues key to a village's social, cultural and economic life: thus, a Gram Panchayat is also a village's body of elected representatives) among the *Adi* tribes of Arunachal Pradesh State, a confusion has croped up as who is the authority of the *Adi* society, whether *Kebang* or Gram (Village) Panchayat of Panchayat Raj system. As a result, the effectiveness of the rural administration was affected. The elders of the village who are well conversant in traditional customery laws were in disarray. On the other hand the young literate panchayat leaders were lacking in traditional knowledge and experiences. In fact the vibrancy and ignorance of the young Panchayat members rocked the very foundation of the traditional *Kebang* system. However, even today,the *Kebang* system is active among the *Adi* community members (Danggen, 2003).

Research and Development Activities of Government Institutions & Departments: Farm research and develomental activities were carried out by the develpmental agencies are not based on the local resourse and also not the local farmers' need based. Provison of in-organic fertilizer subsidy schemes and introduction of exotic high yielding varieties jeoparadises the traditional organic farming of the *Adi* tribal farmers and acclerates the erosion of local varieties. Further, introduction of new varieties, also brought new pest and diseases.

Erosion of Traditional Knowledge and Bio-diversity: The erosion of traditional knowledge and bio-diversity is observed due to socio-ecomonomic and political changes and development pressures, shrinking forest and degradation of related resources, marketisation and commodification. The reduction in plant populations is believed to be caused by commercial agriculture (47.4%), degradation of natural habitats (31.7%) and lack of care for

plant species by younger generation (22.3%). By contrast, the reduction in animal populations was observed due non-adoption of traditional hunting methods and increased trend of commercial hunting using airguns and pistols (Singh *et. al*., 2010).

Modernisation and Media: Modernisation and media influence creates imbalance among the cultural traits of traditional community. For example, the expenditure on food and shelter is negligible, but in contrast to this increased expenditure on cosmetics and recreation is one of the new dimensions of the tribal livelihood as it is found from the field study that the younger generation uses imported cosmetics of high price. And the expenditure on recreation has been raised rapidly in the form of television and other electronic media of entertainment; although living in the remote villages, the facilities have an active presence in the study area (Mukherjee *et. al.,* 2009).

Attitude of Younger Generation: The younger generation of the *Adi* tribal community lack in the traditional knowledge. Further, migration of younger generation for education and employment creates lack of sufficient knowldge about their community. Lack of interest in practising traditional farming methods also noticed.

The Way Forward:

1. The *Kebang* and Village Panchayat roles to be separated. Traditional roles of *Kebang* should be continued for the management of natural resourses and bio-diversity conservation.
2. Traditional crops and cropping patterns need to be tested for its productivity.
3. Traditional knowldge to be documented and validated, refined for wider use by the farmers of the *Adi* community members and others.
4. Traditional pest and diseases control measures to be validated for its efficacy.
5. Tribal farmer participatory research and extension activities to be initiated by the developmental departments and research institutions to facilitate and also to foster the validation and adoption of the local innovations.
6. Traditional homestaed agro-forestry system need to be scitifically validated and promoted among the younger generation.
7. Large number of idegenous food crops used by the *Adi* tribes need to be analysed for its nutritional status and medicinal purposes. And same to be popularised among the younger generation of the *Adi* community.
8. Village traditional crop and knowledge gardens to be established and to be maintained by the community members.

REFERENCES

BHARDWAJ, R., SINGH, R.K., SUREJA, A.K., UPADHYAYA, DEVI, S,M., SINGH, A., (2009), Nutritionally Rich Wild Vegetables of Tribal Communities of Northeast India: Gaining Insights on Valuable Traditional Biocultural Resources. http://www.actahort.org/members/showpdf?booknrarnr=806_30 (Accessed on 5th December, 2009).

DANGGEN, BANI, 2003. *The Kebang : A Unique Indegenous Political Institution of Adis*, Himalayan Publishers, New Delhi.

MISRA, MANOJ KUMAR, DUTTA, RAHUL, 2003. Base Line Information on Medicinal Plants Conservation and Sustainable Utilisation- Arunachal Pradesh. http://www.frlht.org.in/html/reports/arunachal%20pradesh.pdf(Accessed on 5th December, 2009).

MUKHERJEE, R. S., ALI, N., GHOSH, B., 2009. Consumerism in Tribal India : A Case Study from Arunachal Pradesh. http://gbpihed.gov.in/envis/HTML/vol16_1/S.%20(Roy)%20Mukherjee.pdf (Accessed on 11th February, 2010).

SINGH, RANJAY K., PRETTY, J.N., PILGRIM, S. 2010. Traditional Knowledge and Biocultural Diversity: Learning from Tribal Communities for Sustainable Development in Northeast India, *Journal of Environmental Planning and Management*, 53(4): 511-533.

SARANGI, S.K., DE, L.C., SINGH, RAMESH., 2007. Indegenous Life Supporting Plants of Arunachal Pradesh, ICAR Research Bulletin No. 52, ICAR Research Complex for NEH Region, Umiam, Megahlaya, India.

SARAVANAN, R. 2009. A Report on Farmers Information Needs Assessment, e-Arik Project Report No.1, Published from the College of Horticulture and Forestry, CAU, Pasighat, India.http://www.earik.in/index.php?option=com_content&view=article&id=119:e-arik-report-no-1&catid=9:publication&Itemid=12&limitstart=5 (Accessed on 11th February, 2010).

SINGH, R.K., 2009. Agrobiodiversity and Food Security in Risk prone Agro-ecosystems: An Appraisal of Tribals' Wisdom, *Proceedings on International Symposium on Alternative Approach to Enhancing Small-Scale Livelihoods and Natural Resources Management in Marginal Areas-Experience in Manson Asia*, held at United Nations University, UN, House, Tokyo, Japan: from 29-30 October, 2003: 10

SRIVASTAVA, R.C., ADI COMMUNITY, 2009. Traditional Knowledge of Adi Tribe of Arunachal Pradesh on Plants, *Indian Journal of Traditional Knowledge*, Vol 8(2), April 2009, Pp. 146-153.

SUREJA, A.K., SINGH, R.K., BHARDWAJ, R., RAI, A.K., SINGH, D. 2007. Underexploited Vegetables of the Adi Tribe of Arunachal Pradesh, *Abstract Volume of the International Conference on Indigenous Vegetables and Legume: Prospectus for Fighting Poverty, Hunger and Malnutrition*. http://www.actahort.org/members/showpdf?booknrarnr=752_29 (Accessed on 20th February, 2010).